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I, KIM MARSHALL, MANAGER EXAMINATION SUPPORT AND SALES, hereby certify that the annexed is a true copy of the Provisional specification in connection with Application No. PP 5763 for a patent by ROBERT BOSCH GMBH filed on 9 September 1998.

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WITNESS my hand this Eighteenth
day of May 1999

KIM MARSHALL
MANAGER EXAMINATION SUPPORT AND
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Regulation 3.2

ROBERT BOSCH GmbH

AUSTRALIA

Patents Act 1990

PROVISIONAL SPECIFICATION

for the invention entitled:

"A KEY DEACTIVATION METHOD"

The invention is described in the following statement:

A KEY DEACTIVATION METHOD

The present invention relates to a key deactivation method, a key activation method and an entry system.

Passive entry systems are available for vehicles which use remote keys having transponders that communicate with a transceiver of a vehicle, when the transponder is within range of the transceiver. Provided communication between a key and the transceiver follows a predetermined communications protocol, and unique authentication data is exchanged and validated, the key is considered a valid key and the system allows entry to the vehicle. When the valid key subsequently moves out of range of the transceiver, the entry system secures the vehicle by locking and immobilising the vehicle.

When a valid key for a vehicle becomes lost, the key needs to be deactivated so it can no longer be used to gain access to the vehicle. Accordingly, it is desired to a provide simple technique for deactivating lost keys and reactivating found valid keys, particularly when the keys are buttonless.

In accordance with the present invention there is provided a key deactivation method for an entry system, including:

placing at least one valid key in range of a transceiver of said entry system;

executing a predetermined procedure to enter a key validation mode of said system; and

deactivating at least one key for said system which is out of range of said transceiver.

Preferably said deactivating step involves deactivating all previously valid keys for the system which are out of range of said transceiver.

Preferably the predetermined procedure involves executing steps of a start procedure for said vehicle.

Preferably said steps may be executed alternately, instead of simultaneously, or vice versa.

Advantageously, said predetermined procedure involves executing steps using standard controls and operations of said vehicle. The controls may be, for example, a brake or clutch pedal and/or a start or ignition switch, and/or a door handle. The operations may be steps of an entry procedure or a drive procedure of said vehicle.

Preferably said deactivating step includes changing data in said vehicle which indicates said at least one key is valid.

The present invention also provides a key activation method for an entry system, including:

said placing and said executing steps; and

activating at least one key for said system which is in range of said transceiver.

The present invention also provides an entry system, including:

a transceiver;

control means for entering into a key validation mode when a predetermined procedure is executed, validating at least one valid key in range of said transceiver, and deactivating at least one key which is out of range of said transceiver.

Advantageously, the invention may be used when said keys have no activating buttons.

A preferred embodiment of the present invention is hereinafter described, by way of example only, with reference to the accompanying drawing, wherein:

Figure 1 is a block diagram of a preferred embodiment of an entry system.

An entry system, as shown in Figure 1, includes an electronic control unit (ECU) 2 which is mounted in a vehicle and includes processing circuitry to communicate with other electrical and electronic components of the vehicle and the entry system. In particular, the ECU 2 includes an rf transceiver 14 for generating an rf signal which excites the transponder of a remote key 4 of the entry system, when the key 4 is within the vicinity of the vehicle. The key 4 may comprise a card or fob. Once excited, the key 4 uses rf transmission techniques to communicate with the transceiver 14, in accordance with a secure communications protocol, in order to pass authentication data from the key 4 to the ECU 2. Once received, the ECU 2 compares the authentication data with security data that it holds in its memory, being security codes and enable flags stored in an EEPROM 12. When the ECU 2 finds a match between the received authentication data and its own security data, the ECU 2 issues signals to other components of the vehicle to enable access to the vehicle by a holder of the key 4. When the key 4 is removed form the immediate vicinity of the vehicle, this is detected by the transceiver 14, which causes the ECU 2 to generate signals to secure the vehicle, for example by locking and immobilising the vehicle.

Normally, a number of valid keys can be used with the entry system to gain access to the vehicle. The keys 4 each include a unique serial or identification number and this is communicated to the ECU 2 as part of the authentication data. The ECU 2 stores the serial numbers for each valid key in its EEPROM 12, and against each serial number an enable flag is stored. During the authentication procedure when the ECU 2 verifies the authentication data, the ECU 2 checks to determine if the received serial number of the communicating key 4 is stored in the EEPROM 12 and whether its enable flag is set or reset. If the serial number is found and the enable flag is set, then the communicating key constitutes a valid key which can be used to gain access to the vehicle. If however the serial number is found and the enable flag is not set, then the communicating key is no longer a valid key which can be used. The

ECU 2 is able to execute a key deactivation and activation procedure which resets and sets the enable flag for keys 4. This allows an owner of the vehicle to deal with lost or stolen keys in a simple manner, as described below.

When a valid key is lost or stolen, the holder of at least one remaining valid key can place the ECU 2 in a key validation mode to validate all of the remaining keys. The holder of the remaining keys simply enters the vehicle, places all of the remaining keys within range of the transceiver 14, and executes a predetermined procedure to place the ECU 2 in the key validation mode. Once placed in the key validation mode, the ECU 2 energises all of the keys 4 within its range, to receive their serial numbers, and sets the enable flags in the EEPROM 12 for the serial numbers received, whilst resetting the enable flags for any other key serial numbers stored in the EEPROM 12. The keys that are therefore within range of the transceiver 14 will then constitute valid keys, and the lost or stolen key will no longer be a valid key, as its enable flag is reset. Completion of the key validation procedure is indicated by the ECU 2 which generates a completion signal for a message unit 6. The message unit simply indicates either visually or audibly that the key validation procedure is completed. The message unit 6 may be an LED in the vehicle or the vehicle's horn or siren. The message unit 6 may also be a display unit in the vehicle which receives and is able to display data indicating the keys which are valid for the vehicle. The display unit would also display other messages, such as "key validation completed" and can include controls which allows a user of the vehicle to recall a display indicating the valid keys, such as keys A, B and C.

When the lost or stolen key 4 is recovered, the key 4 can be revalidated or activated by again taking all of the keys into the vehicle, and placing the ECU 2 into the key validation mode, to execute the above key validation procedure. The enable flag for the found key 4 will then be set in the EEPROM 12.

To avoid the requirement for any additional hardware components to be added to the vehicle, the predetermined procedure used to place the ECU 2 in the key validation mode needs to be executed using existing vehicle components. The predetermined procedure should

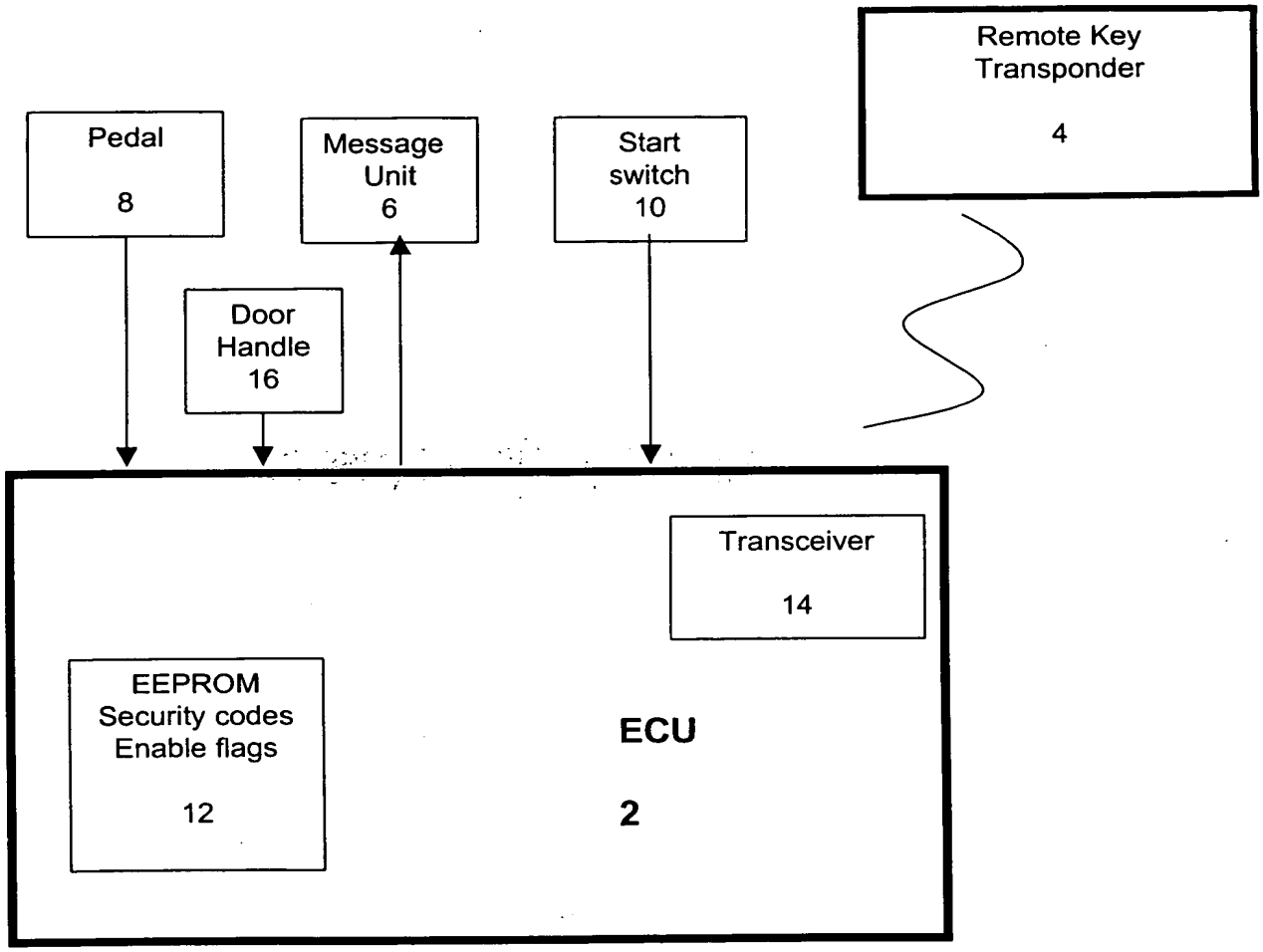
advantageously involve using components and operations which are normally involved in a start or entry procedure for the vehicle. Most vehicles have a start procedure which involves pressing a pedal 8, which may be the brake or clutch pedal, and then simultaneously turning on an ignition start switch 10 of the vehicle. The ECU 2 is connected to the electrical network or wire looms of the vehicle so as to receive signals generated when the pedal 8 is depressed and the start switch 10 is turned on. The predetermined procedure to enter the key validation mode can then involve a holder of the keys simply depressing the pedal 8 and turning on the start switch 10 alternately a number of times, say three times, instead of simultaneously. The ECU 2 on detecting depression of the pedal 8 and the start switch 10 alternately can then generate a message for the message unit 6 to confirm entry into the key validation mode when the predetermined procedure has been executed. The ECU 2 can also issue cues on the message unit 6 to follow the time sequence for depression of the pedal 8 and turning on the start switch 8, to assist a holder of the keys in correctly executing the procedure to enter the key validation mode. Alternatively the steps and components used for an entry procedure for the vehicle can be used. For example, in some passive entry systems the key is excited on lifting of a door handle 16. The predetermined procedure required to enter the key validation mode may require a holder of the keys to lift the door handle 16 a number of times within a period of time, say four times in two seconds.

The ECU 2 can be provided by or divided into a number of ECUs, and similarly the vehicle can include a number of transceivers and antennas to communicate with remote keys 4. The keys 4 may be passive entry keys which require energy from the vehicle in order to communicate with the ECU 2 or the keys may have their own battery power supply. Also, whilst the present invention is particularly advantageous for keys which have no activating buttons, the keys 4 can include activating buttons and the entry system may be a combination active and passive entry system. For example, the entry system may be such that the key 4 is able to communicate over a distance, of say 30 m, with the vehicle when activated, and is also able to be energised or excited when closer to the vehicle by lifting of a door handle, or some other activation device, when in the vicinity of the vehicle.

Many modifications will be apparent to those skilled in the art without departing from the scope of the present invention as hereinbefore described with reference to the accompanying drawing.

DATED this 9th day of September, 1998

ROBERT BOSCH GmbH
By its Patent Attorneys
DAVIES COLLISON CAVE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Transponder
4
Pedal
8
Message
Unit
6
Start
switch
10
Door
Handle
16
Transceiver
14
EEPROM
Security codes
Enable flags
12
ECU
2

Figure 1